1 463 671

PATENT SPECIFICATION

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(54) WALLCOVERINGS

(71) We, IMPERIAL CHEMICAL INDUSTRIES LIMITED, Imperial Chemical House, Millbank, London SW1P 3JF, a British Company, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to wallcoverings.

There is an increasing interest in dry strippable wallcoverings but one of the disadvantages thereof is that, if the wallcovering is too readily strippable, it may be removed from the wall unintentionally. Thus there is a risk that children will strip the covering from the wall accidentally or without express authority.

Accordingly it is desirable that the wallcovering has increased adhesion at the edges of the wallcovering piece so that it is more difficult to initiate stripping and yet, once initiated, the whole piece is readily strippable.

In our U.K. patent specification 1,306,373 we described a wallcovering material made from a surface treated polyethylene blend foamed film. The preferred surface treatment comprised corona discharge treatment.

We have now found that if the reverse surface of the film (i.e. the surface that is not printed upon and which is to be adhered to the wall) is corona discharge treated at the edges, then the film exhibits increased adhesion at the edges. Alternatively the surface to be printed upon (i.e. the front surface) may be corona discharge treated to a greater extent at the edges to achieve a similar effect because the effect produced by discharge treating the front surface also appears to some extent on the reverse surface and in particular the greater treatment along the edges appears sufficiently to resist unintentional stripping.

Accordingly we provide wallcovering comprising a foamed film formed from a blend of between 60% and 90% by weight of low density polyethylene and, correspondingly, 40% to 10%, by weight, of a crystalline stereoregular polyolefin, said percentages being based on the combined weight of the low density polyethylene and the crystalline polyolefin, having an open celled structure wherein between 40% and 90% by volume of the film consists of open cells, wherein the front surface of the film is corona discharge treated all over and the reverse surface is corona discharge treated along bands adjacent the longitudinal edges of the film.

The discharge treatment of the reverse surface is preferably effected in line with the discharge treatment of the front surface.

Generally the film is trimmed to a standard wallcovering width of about 54 cm. The trimming to width is preferably effected after discharge treatment and printing. Also after printing the film is cut into pieces of length about 10 m.

It will be appreciated that the film may be extruded in greater widths so that it can subsequently be slit and trimmed into two or more standard wallcovering widths. In that case, if the film is discharge treated prior to such slitting, it is necessary to discharge treat, in addition to the longitudinal edges of the film, one or more bands intermediate the edges of the film so that bands adjacent all the longitudinal edges of the slit standard wallcovering width film are discharge treated.

As already indicated, instead of discharge treating both surfaces of the film, only the front surface need be discharge treated provided that the surface is given a greater degree of discharge treatment along bands adjacent the edges of the film (or at intermediate bands where a multiple width film is extruded and is subsequently slit and trimmed to standard wallcovering widths after discharge treatment).

Accordingly we also provide a wallcovering comprising a foamed film formed from a blend of between 60% and 90% by weight of low density polyethylene

and, correspondingly, 40% to 10%, by weight, of a crystalline stereoregular polyolefin, said percentages being based on the combined weight of the low density polyethylene and the crystalline polyolefin, having an open celled structure wherein between 40% and 90% by volume f the film consists of open cells, wherein the front surface of the film is corona discharge treated all over and wherein the corona discharge treatment is performed to a greater degree along bands adjacent the longitudinal edges of the film.

The bands adjacent the edges of the final, trimmed, standard width film that have been discharge treated preferably have a width of 1 to 10 cm, preferably 2 to 7 cm.

Normally about 1 to 3 cm of film is removed as edge-trim to obtain the final trimmed standard wallcovering width film and so the width of the bands adjacent the edges of the untrimmed film (and intermediate bands if a multiple width film is discharge treated prior to slitting) that are discharge treated should be increased from the aforementioned band widths by the amount of edge trim.

The foamed film is made from a blend of between 60% and 90% by weight of low density polyethylene and between 40%and 10% by weight of a crystalline steroregular polyolefin, said percentages being based on the combined weight of the low density polyethylene and the crystalline polyolefin.

By low density polyethylene we mean homopolymers and copolymers of ethylene having a density of less than 0.934 g/cm^3 (measured at 23°C according to British Standard 3412 of 1966). The copolymers should contain no more than 20% by weight of monomers copolymerisable with ethylene. By the term crystalline steroregular polyolefin we mean crystalline steroregular olefin polymers made using a sterospecific catalyst. Examples of such polymers include high density polyethylene, by which is meant polyethylene of density between 0.94 and 0.97 g/cm^3 (measured at 23°C according to British Standard 3412 of 1966), isotatic polypropylene or crystalline stereoregular copolymers of ethylene and propylene may be used. High density polyethylene is our preferred crystalline polyolefin.

The foamed films have an open-celled structure wherein between 40% and 90% of the volume of the film consists of open, i.e. interconnected, cells. The proportion of open cells may be determined according to the method of Remington and Pariser set out in Rubber World, May 1958, pages 261 to 264. The films are preferably between 0.01 and 0.03 inch thick, of bulk density between 0.1 and 0.4 grams cm^{-3} and as they are generally produced by extrusion, the cells tend to be oriented long the axis of the cell parallel to the machine direction. The majority of the cells are between 100 and 500 microns long and between 20 and 150 microns wide.

Such films are conveniently made by extrusion of a mixture of the polymer blend, any desired additives such as antioxidants, UV stabilisers, pigments and/or opacifiers, and a blowing agent system comprising a volatile liquid, such as pentane, and a gas such as nitrogen. Such a process is described in more detail in our U.K. patent specifications 1,220,053 and 1,306,373.

As described in the aforesaid specification 1,306,373, the incorporation of the crystalline polyolefin increases the abrasion resistance of the film and discharge treatment gives films having good ink abrasion resistance. Since the ink abrasion resistance of the film when wet after discharge treatment tends to decrease as the amount of crystalline polyolefin in the blend increases, we prefer to use blends containing from 20% to 35% by weight of high density polyethylene and from 80% to 65% by weight of low density polyethylene.

The film is preferably corona discharge treated by the method illustrated in Figure 5 of page 139 of "Plastics and Polymers", April 1969. Other particularly suitable methods are those disclosed in British Patents 1,042,049 and 1,100,414. The speed at which the film travels through the discharge treatment apparatus and the potential applied to the electrodes should be adjusted to obtain the required ink abrasion resistance, particularly resistance when wet, and adhesion properties and will depend upon the proportion of crystalline polyolefin in the blend.

Three methods of applying the corona discharge treatment to the film will now be described by reference to the drawings accompanying the provisional specification wherein,

Figure 1 is a perspective view of a discharge treatment assembly wherein an additional treatment is given to bands on the surface of the film to be printed upon.

Figure 2 is a diagrammatic elevation of an alternative system for providing a greater degree of treatment to bands on the surface of the film to be printed upon.

Figure 3 is a perspective view of a discharge treatment assembly wherein both sides of the film are discharge treated.

In the embodiment depicted in Figure 1 the film 1 is led over an earthed roller 2. First a corona discharge is applied to the surface of the film that does not contact the roller (the eventual front surface) all across the film width by means of an electrode 3 connected to a high voltage source 4.

Discharge is then applied to bands adjacent the longitudinal edges of the eventual reverse surface of the film by secondary electrodes 5 connected to electrode 3. Discharge is also applied to a band down the centre of the film by means of a further secondary electrode 6.

The film can then be printed, slit and trimmed into two standard wallcovering widths. The additional discharge treatment by the secondary electrodes 5 and 6 causes the reverse side of the film, at the treated bands, to exhibit increased adhesion to a wall to which the wallcovering is adhered by conventional means.

As a modification to this technique, the electrodes 5, 6 may be connected to a separate source of high voltage thus providing more control over the degree of additional treatment.

In the embodiment depicted in Figure 2 a single electrode 7, connected to a high voltage source, not shown, is utilised spaced from an earthed roller 8. The film 9 is passed therebetween. Where additional discharge treatment is required, i.e. adjacent the film edges and at the centre, the electrode is shaped such that the gap between the electrode and the film is less than over the remainder of the film.

Typically the film, to give two standard wallcovering widths after trimming, is 114 cm wide and the width of the edge bands, before trimming, that are given the additional discharge treatment is 6.4 cm. The central band is typically of width 13 cm. Typically the "normal" gap between the electrode 7 and film 9 is 1.4 mm while the reduced gap width, where the additional treatment is required, is 0.8 mm.

In the embodiment depicted in Figure 3 an arrangement similar to that of Figure 1 is used but two rollers 10, 11 are used round which the film 13 takes an "S" shaped path. The main electrode 12 extends across the whole width of the film 13 to discharge treat the whole of one surface of the film while the secondary electrodes 14 discharge treat bands of the reverse surface of the film adjacent the edges and down the centre of the film.

In addition to being of use for wallcoverings, the film may also be used for ceiling coverings and the term "wallcoverings" includes ceiling coverings.

WHAT WE CLAIM IS:—

1. A wallcovering comprising a foamed film formed from a blend of between 60% and 90% by weight of low density polyethlene (as hereinbefore defined) and, correspondingly, 40% to 10%, by weight, of a crystalline stereoregular polyolefin (as hereinbefore defined) said percentages being based on the combined weight of the low density polyethylene and the crystalline polyolefin, having an open celled structure wherein between 40% and 90% by volume of the film consists of open cells, wherein the front surface of the film is corona discharge treated all over and the reverse surface is corona discharge treated along bands adjacent the longitudinal edges of the film.

2. A wallcovering according to claim 1 whose reverse surface has been discharge treated along one or more bands intermediate the edges of the film.

3. A wallcovering according to claim 1 or claim 2 whenever made using apparatus substantially as hereinbefore described and illustrated diagrammatically in Figure 3 of the drawings which accompanied the provisional specification.

4. A wallcovering comprising a foamed film formed from a blend of between 60% and 90% by weight of low density polyethylene (as hereinbefore defined) and, correspondingly, 40% to 10%, by weight, of a crystalline stereoregular polyolefin (as hereinbefore defined), said percentages being based on the combined weight of the low density polyethylene and the crystalline polyolefin, having an open celled structure wherein between 40% and 90% by volume of the film consists of open cells, wherein the front surface of the film is corona discharge treated all over and wherein the corona discharge treatment is performed to a greater degree along bands adjacent the longitudinal edges of the film.

5. A wallcovering according to claim 4 wherein bands intermediate the edges of the film are also subjected to a greater degree of discharge treatment.

6. A wallcovering according to claim 4 or claim 5 whenever made using apparatus substantially as hereinbefore described and illustrated diagrammatically in either Figure 1 or Figure 2 of the drawings which accompanied the provisional specification.

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1463671 PROVISIONAL SPECIFICATION
2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 1

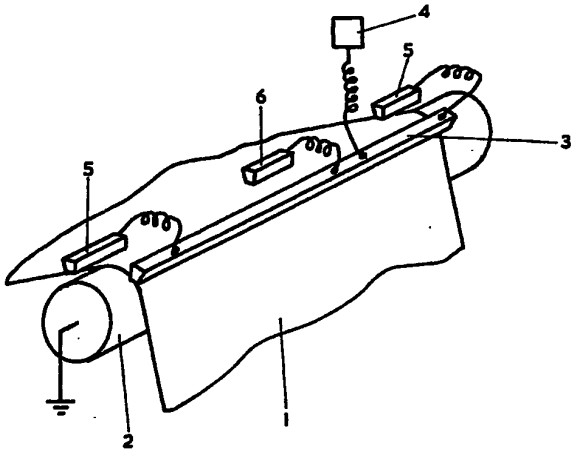

FIG 1

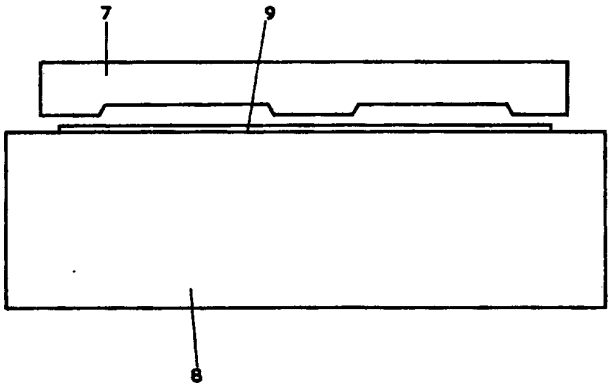

FIG 2.

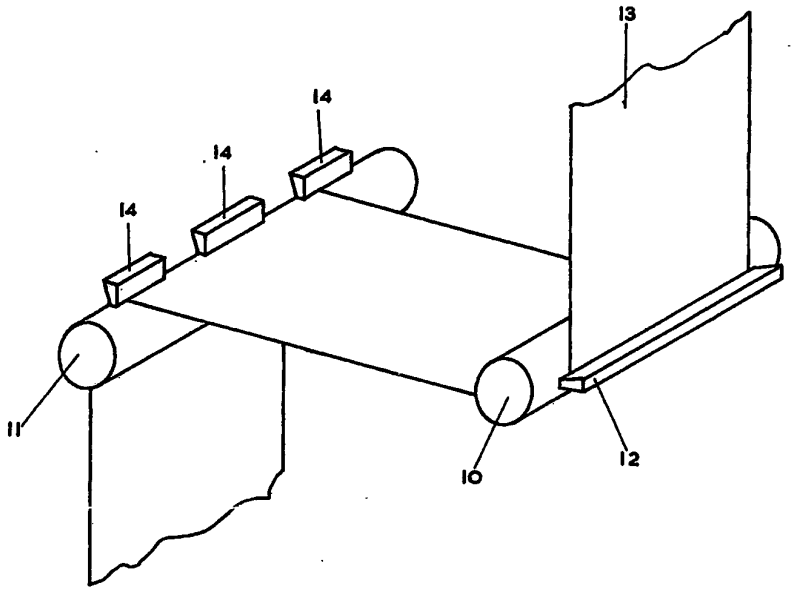

FIG 3